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Mr. William F. Caton
Secretary
Federal Communcations Commission
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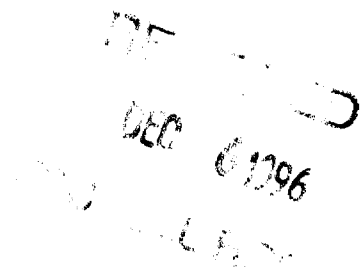
Room 222
Washington, D.C. 20554



5 December 1996
Dear Mr. Caton,

Enclosed via Fedex please find 10 copies of our reply to the commission's request for comments concerning the agreement of 27 November.

Also enclosed, you will find individual envelopes for the chairman, the commissioners, and for Dr Pepper and Mr Shapiro.

Respectfully submitted,

Gary Demos
President/C EO
DemoGraFX

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems and Their	)	MM Docket No. 87-268
Impact Upon the Existing Television	)	
Broadcast Service	)	

To: The Commission

3 December 1996

COMMENTS OF DEMOGRAFX

in response to
The Commission Seeking Comments on Digital TV Standards Agreement
Released 27 November 1996

These comments are in response to the commission seeking comments on the Digital TV Standards Agreement dated 27 November 1996. The window for these comments closes this Friday, 6 December.

Background

Apparently, according to the press, in late October, commissioner Ness sent a letter to some of the participants in the Advanced Television debates concerning the selection of a standard for the United States. In this letter, apparently the recipients of the letter were being asked to reach a compromise agreement before Thanksgiving (27 November).

However, DemoGraFX was not a recipient of such a letter from commissioner Ness, and DemoGraFX was not included in any discussions which took place during the month of November leading to this Digital TV Standards Agreement.

Since we have been a key player in the issues and technology related to Advanced Television, we are not sure as to why we were excluded from commissioner Ness's letter, or from the discussions leading to this agreement. However, having only learned of this agreement when it was announced last week, DemoGraFX is in a position to provide an independent evaluation and comment on the agreement and its implications, were it to be acted upon by the commission. The parties to the agreement are listed in the agreement as being composed of "broadcasters, computer industry representatives ("CICATS"), [and] receiver manufacturers" (first sentence of agreement). The agreement (in item 4) states that none of these parties will comment critically upon the issues in this agreement for some period of time.

Thus, at this point, neither the CICATS members, nor "broadcasters" nor "receiver manufacturers", can comment, by the agreement, other than favorably.

Thus, it is left to others, such as DemoGraFX, to provide independent input and critical analysis in response to the commission's request.

Since DemoGraFX, acting as a consultant, helped organize CICATS, we have respect for their issues and their efforts in attempting to reach a compromise. The commission should be aware that I share the primary concern of CICATS members toward the removal of interlace from all

formats. However, apparently the insistence on interlace among those claiming to represent "broadcasters" and "receiver manufacturers" prevented such a removal within the agreement.

DemoGraFX has also been an ally to the Film Coalition, and has worked closely with the ASC, DGA, International Photographer's Guild, and the Artist Rights foundation. The agreement states (second sentence, first paragraph) that the Film Coalition was not a party to the subject agreement. DemoGraFX does not know how this omission occurred. However, it now falls solely to the commission to address the Film Coalition's key issues.

It is our impression that the intent by the commission to act by the end of December, (as stated in the commission's request for comments), does not allow much time for investigation or analysis. The agreement, by removing the video formats, creates a very different ATV standard than was previously before the commission in the former ACATS/ATSC standard. The recognition of the differences, their subtleties and implications, should precede any decisions.

It may not be sufficient for the parties to the negotiation to have agreed on a compromise, since the compromise was both politically charged and strenuous. The results of such a negotiation may therefore lead to technical omissions or errors, and well as hidden meanings which have not yet been fully realized.

Remembering the commission's formation of the original NTSC committee around 1940 to review, amend, and improve the industry-backed RMA proposal, as well as the commission's reversal of its initial acceptance of the CBS color-wheel system around 1950, being replaced with the NTSC-2 color standard that we use today.

Thus, there has been a history of industry-lead television standards requiring major revision or complete replacement prior to actual deployment. Caution is therefore prudent in analyzing and considering technical, political, economic, and artistic implications prior to the commission making a commitment.

Whatever hurry that there may be in the minds of some, must be weighed against the potential costs and embarrassments of a decision to base a national infrastructure such as ATV on incorrect or incomplete standards or agreements. Thus, it falls to the commission to do a thorough independent analysis of the implications of the agreement prior to taking action.

DemoGraFX hopes that our comments are a useful starting point, but we submit that additional input and analysis will be needed, both from DemoGraFX as well as other independent objective parties.

Design by closed-door negotiation, such as that which lead to this agreement, as well as design by committee, such as that which lead to the ACATS/ATSC proposal, are both often less than optimal. Even though all the parties may be well-meaning, the resulting proposal of this agreement must be weighed on its own merits to determine whether it is suitable for deployment as the standard for a national television infrastructure.

Overall Impression

The overall impression of DemoGraFX is that we are pleased that it appears that we will be allowed to compete in ATV, which would not have been possible with the ACATS/ATSC A/53 proposal (which included "Table 3"). We are grateful that the agreement apparently would allow us to build a business based upon our ATV system in competition with the ATSC 18-format-based system.

However, DemoGraFX feels that there are issues which are unclear, unduly limiting, or which are unaddressed. There are also issues related to the consumer interest which the commission could directly address, where industry has been unable to solve the problems.

DemoGraFX therefore offers the following specific comments on the agreement and its implications.

Our DemoGraFX Perspective

As the commission is aware, DemoGraFX has developed techniques for layering MPEG-2 which substantially improve the performance and reduce the cost of ATV. These improvements replace much of the ATSC standard related to video formats, although they are independent of the audio, modulation, error correction, and packet formats.

The DemoGraFX system has stood as the only competing ATV proposal in the United States since we announced our system at the SMPTE conference in early February 1996. We still stand today unchallenged in our ability to provide layering, exceed MPEG-2 performance, and achieve the full resolution (2048 x 1024 @ 72 Hz) without interlace.

No credible criticism of our ATV system has come forth after hundreds of demonstrations to industry experts, despite our open technical presentation of all of the details of our techniques.

We thank the honorable chairman Reed Hundt and the honorable commissioner Rachelle Chong for taking the time to come see a demonstration of our ATV system. We were also pleased that some key commission staff members were also able to be present at these demonstrations.

Despite what anyone may say about any political or technical aspect of our system, you have each seen the results with your own eyes. Seeing the result should be the main criterion for evaluation, although our computer-compatibility, improved aspect ratio and frame rate, and layering provide significant additional benefits. Our 200 : 1 compression is virtually indistinguishable from the original, achieving much greater compression at much higher quality than the ACATS/ATSC ATV proposal. As you now know, this must be seen to be evaluated. For the honorable commissioners Ness and Quello, I hope that you, as well as other commission staff, take the opportunity to see our demonstration when you next come to the west coast.

The DemoGraFX ATV system was designed as a whole system, unlike the ACATS/ATSC proposal which was designed by committee, and unlike the agreement in question, which was the result of a negotiation of competing proposals.

The DemoGraFX ATV system is therefore the only proposal before the commission which was conceived as a whole from first principles. It is designed such that its constituent parts fit together to make a whole, rather than being constructed of unrelated parts which are agglomerated together for political reasons.

The DemoGraFX system is based upon the following principles:

- The ATV receiver should be optimized for the highest perceived quality at the lowest cost.
- Layering is required so that consumers can be provided with a choice of cost vs. quality.
- Computer compatibility is a requirement, not an option, for an ATV system for the U.S.
- Historic television practices, whose motivations are now obsolete, need not be perpetuated.

In order to achieve the highest perceived quality, the principles of human visual perception have been the key guide for the development of the DemoGraFX system. The human visual perceptual issues have lead us to discover the following key principles:

• Images which are captured (in the camera), transmitted, and displayed without interlace are significantly clearer and cleaner to the eye than images which use interlace at any step.

• A 72 Hz display rate is necessary to eliminate flicker in human vision for large bright screens.

• A high rate of motion in the images, such as 72 frames-per-second, increases clarity and realism when the images are moving moderately to rapidly, as in sports (note, 60 frames-per-second does not provide this clarity or realism on the required 72 Hz flicker-free display).

• We also discovered that every-other-frame (36 Hz) of the 72 frame-per-second looks good to the eye, whereas every-third-frame (24 Hz) has insufficient motion blur and appears painfully staccato as a result. This discovery is the basis for DemoGraFX temporal layering.

• For movies, which uniformly use 24 frames per second, a 72 Hz display rate is significantly improved over a 60 Hz display (which must utilize "3-2 pulldown").

• The rich colorimetry of film provides a much more aesthetically pleasing image than that of television proposals (such as the ACATS/ATSC colorimetry).

• The 2 : 1 aspect ratio is more aesthetically pleasing than the 1.78 (16:9) aspect ratio.

• The original aspect-ratio composition of a movie, presented on a wide screen, will be more pleasing to the eye than the same movie cropped and expanded to fill a narrower screen.

• The issues above are as important for perceived visual quality as resolution.

• Full resolution (2048 x 1024) is achievable within the 6Mhz channel (19.3 mbps at 72 Hz, 8mbps at 24Hz) and the eye can see resulting resolution improvement. This result is also clearer and sharper than interlaced 1920 x 1080 HDTV systems.

The commission has not seen the results of some of the perceptual experiments which we have performed to make these determinations. In particular, we have not yet had sufficient time to demonstrate issues related to frame rate and display rate to the commission. We would therefore invite the commission to attend a more in-depth presentation, so that these additional issues may be demonstrated.

It may also be useful to summarize historical television parameters, still embodied in the ACATS/ATSC proposal's Table 3 (now presented as optional under the agreement) whose motivation is now obsolete:

• 60 Hz (power line frequencies tied to displays helped with power supply regulation in 1950's)

• 59.94 Hz (related to color subcarrier and sound carrier harmonics in 1950's, not relevant to modern component ATV)

• Interlace (provided some additional detail at the expense of small-area flicker using the low-resolution black-and-white television cameras of the 1940's)

• Limited Television Colorimetry (tied to availability of color television phosphors in the 1960's)

• Non-square pixel spacing (e.g. 720 and 704 horizontal formats in the proposed optional ATSC format Table 3, tied to analog television and to the desire in the mid 1980's by some companies to manufacture a common D1 tape machine for both PAL and NTSC, therefore based upon the obscure relationship of the line rates between PAL and NTSC).

• 1920 Horizontal resolution (based upon 720, relating 16:9 to 4:3 and doubling 720 to 1440, standardized in the late '80's).

Issues of the Film Coalition

Although DemoGraFX does not represent the Film Coalition, we are sympathetic and supportive of their issues. We also hold the members of the Film Coalition in the highest regard, as the true experts on aesthetic issues including composition, motion, color fidelity, and images sharpness.

DemoGraFX therefore urges the commission to carefully consider and also address the issues raised by the Film Coalition.

DemoGraFX suggests that the commission is an appropriate governmental representative of the public interest in ATV matters. This role is further underscored by the public trust implied by the allocation of spectrum for ATV without compensation back to the government (e.g. without spectrum auctions for ATV spectrum). This public trust, combined with the commission's role acting as the public's agent, entitles the commission to act to ensure the public's right to see every motion picture work in its original aspect ratio, as well as to see the work with proper colorimetry and frame rate.

As with closed-captioning, the commission can mandate or forbid practices. With closed captioning, the commission can require its use, can forbid its non-use, and can require receivers be able to receive and display it, and forbid them to be offered for sale if they cannot so receive and display. Similarly, with UHF, receivers were required to have UHF reception capability, and were forbidden from sale without such capability. Of greatest relevance, however, is the public interest obligation that accompanies the free allotment of spectrum to broadcasters. The public interest is not served if the original works being conveyed are altered or impaired for transmission. Broadcasters have lost their license over this issue in the past, and the commission could use similar obligations to ensure integrity of programming as a condition of holding new digital spectrum licenses.

For these reasons, DemoGraFX recommends that the commission specify each of the following, independently, or in addition to the agreement which is the subject of these comments.

• Films must be transmitted only in their original complete form and aspect ratio. Therefore, no film image may be cropped in any digital ATV channel.

• Digitally-capable ATV receivers should be able to receive and display films in their original aspect ratio.

• Films must be sent in their original colorimetry. Therefore, the color of films may not be altered to match video colorimetry.

• Films must be sent in their native 24 frame-per-second rate. Therefore, 3-2 pulldown may not be used in any digital ATV channel.

Note that these integrity requirements are independent of the agreement (except for colorimetry, which requires a minor addition). Thus, the commission would not be altering the agreement, but rather would be augmenting the agreement with these additional public interest requirements.

No parties are harmed by these requirements, and the public would greatly benefit. Thus, DemoGraFX asks the commission to add these requirements to the standard for transmission, and add the requirement that digital receivers be capable of displaying the entire original work.

Aspect Ratio Implications Of The Agreement

With the removal of Table 3 of the ATSC proposed standard, and the removal of the aspect ratio restrictions, the overall proposal is definitely improved.

As best as we understand the proposal in the agreement, each of the following important aspect ratios would now be enabled:

- 1.85 : 1 (the narrower of the two common wide-screen formats)
- 2.37 : 1 (the wider of the two common wide-screen formats)
- 2.0 : 1 (the new aesthetically and technically pleasing ATV template)
- 1.33 : 1 (now allowed in high resolution)

This is certainly an improvement over a mandated 16:9 aspect ratio in the transmission template, as was previously mandatory in the ATSC standard.

For this step of progress, DemoGraFX applauds the agreement.

A careful reading and analysis of the agreement and its aspect ratio implications should verify that this is now true.

Interlace Implications Of The Agreement

The agreement proposes that the commission allow any video format which fits within the "Main Profile at High Level" of MPEG-2. Note that this would allow interlaced formats to be transmitted. The interlaced formats which might then be transmitted include:

- 1920 x 1080 at 60 interlaced and 59.94 interlaced (the ATSC HDTV interlaced format)

- 1920 x 1035 at 60 interlaced (the Japanese HDTV format, not previously allowed by the ATSC)

- 704 x 480 at 60 interlaced and 59.94 interlaced (the "Main Profile Main Level" ATSC SDTV format)

These formats have been the subject of intense debate, as the commission is well aware. They were also the subject of the focus of negotiation leading the agreement. However, the removal of these formats was not possible due to the unyielding position of the "broadcasters" and "receiver manufacturers" who were present in the negotiation.

Thus, the commission must now face and analyze the implications of allowing these and other interlaced formats.

These implications include:

• De-interlacers will be required for any receiver attempting to display a computer-compatible (non-interlaced) image from any of these signals.

• Such de-interlacing will add cost to any computer-compatible devices desiring to display these signals

• Such de-interlacing will degrade quality for any computer-compatible devices vs interlaced television-like devices.

• Frame rate conversions will also be needed for computer-compatible display systems, since the images refresh at rates exceeding 70 Hz.

• Such frame rate conversions will degrade motion smoothness for computer-compatible displays.

• Such frame rate conversions will add cost.

Thus, by allowing these interlaced formats to be transmitted, the commission is burdening every computer-compatible receiver which wishes to receive these signals with extra cost and degraded quality compared to interlaced old-style television receivers.

These interlaced formats, by being allowed, therefore bias the market against computer compatibility, and create a direct economic and quality hindrance to the convergence of computer displays and televisions.

The commission could go a long way to removing this barrier by forbidding the transmission of interlace.

• Thus, DemoGraFX recommends that the commission require that interlace not be allowed in the transmission channel.

Again, this does not modify the proposed agreement, but rather is in addition to it.

It is obvious from the heated debates over the past years that industry cannot negotiate any scenario for transcending interlace. It is admitted by all parties that interlace is inferior in quality, that it damages the signal, and that it should be only be deployed temporarily, until non-interlaced (progressive scan) systems can completely replace it. However, even with these admissions, the degree of insistence that interlace must be deployed has defied all reason.

Thus, it falls to the commission to take the step of eliminating interlace as an additional step toward serving the public interest. The public interest is not served by adding cost and degrading quality in every computer-compatible receiver.

Computer compatibility with television is the central theme of the National Information Infrastructure. The public would greatly benefit from the convergence of these media. The public interest is served by enabling this convergence, not hindering it by allowing interlace.

In the absence of such a step, the commission may find that the interlaced HDTV and SDTV formats, including the relatively unsuccessful Japanese interlaced HDTV format, may flood the marketplace using the existing inventories of obsolete interlaced equipment. The commission need only query those broadcasters having or seeking experimental HDTV licenses to find how

many such broadcasters are intending to produce and transmit the Japanese HDTV format, or its 1080-line ATSC variant. I think the commission will find that it is the majority.

Note also, that under the agreement, the Japanese HDTV format (also called SMPTE 260M), would be allowed. This format has non-square pixel spacing, in addition to interlace and 60 Hz. Thus, the additional degradation of non-square pixel spacing in formats becomes a choice for broadcasters, and therefore another burden for receivers.

Thus, the commission must realize that by allowing alternative video formats, non-interlaced formats which are computer-compatible do become possible in the market. However, market forces due to the existing inventories of interlaced equipment may hinder, delay, or even prevent the deployment of a proper ATV system for the United States. The only ATV system which is proper for the United States is one without interlace.

It must certainly be the commission's goal to ensure that the national result of the commission's rulings on ATV leads to a non-interlaced (progressive scan) system at some time in the future. The utmost failure would be for the nation to have an entrenched digital interlaced system in ten or twenty years, due to mis-steps at this time.

Thus, the commission must satisfy itself that interlaced formats will be removed from the nation's television signals within a short period, perhaps three to five years. However, it will take this long to deploy the infrastructure.

It therefore does not make sense to begin deploying interlaced formats, since the result is likely to be a nation shackled with interlace a decade from now.

DemoGraFX therefore asks the commission to shoulder the responsibility of ensuring that interlace does not become the defacto national infrastructure. There is apparently no other way that such a damaging outcome can be prevented. Market forces are presently leading away from this goal, such that it falls to the commission to steer the ship toward the national goal of an interlace-free digital television system. The agreement must be augmented by the commission for this to happen.

Limitations Within "Main Profile, High Level"

We think that the intent of the agreement to restrict all video formats to fit within MPEG-2's "Main Profile, High Level" is to bound the performance of the receiving decoder.

In order to bound this performance, all that is required is a maximum pixel rate, and a maximum memory size.

The profiles do specify maximum pixel rate, and by implication of the resolution maxima, the maximum memory size. However, the profiles were also burdened with many additional limitations which are completely unnecessary. Many of these restrictions were politically motivated, or were motivated by those who wanted to ensure interlace and 50 or 60 Hz.

The commission should carefully analyze the implications of restricting video formats to fit within the restrictions of "Main Profile High Level".

These restrictions include:

- Frame rates limited to 23.98, 24, 25, 29.97, 30, 50, 59.94, and 60 Hz
- Frame rates may not exceed 60 Hz
- Maximum horizontal resolution of 1920 pixels
- Maximum vertical resolution of 1152 lines
- Maximum pixel rate of approximately 62 Mpixels/sec

Of these limitations, the frame rate restriction is the most problematic. The key DemoGraFX rates or 36 and 72 Hz are not allowed under "Main Profile, High Level".

We do not know if this was an oversight, or if it was an intentional obstruction to DemoGraFX system and our ability to compete in the market.

Fortunately, the 60 Hz mode allows a frame-repeat flag, such that 36 Hz can be synthesized within the 60 Hz (or the 50 Hz) rates. However, this is somewhat wasteful and clumsy.

The DemoGraFX system also produces a final raster of 2048 pixels in width, by 1024 in height. Although the height is not an issue, the 2048 width exceeds the artificial horizontal limitation to 1920 pixels within this profile. In our original filing on the fifth notice in this proceeding (pg 32), we described in great detail the now-irrelevant origin of the 1920 number.

Fortunately, however, we create the 2048 x 1024 image by removing a border within the enhancement layer, allowing us to fall under the 1920 width. The base layer is well below the 1920 and 1152 maxima. However, we think that the commission should eliminate or increase the 1920 limitation.

Some of the parameters in "Main Profile, High Level", such as 25 and 50 Hz, and 1152 scanlines, were intended for European use and PAL compatibility, and are therefore irrelevant to a U.S. ATV standard, although all of these would now be allowed under the agreement.

We therefore ask the commission to remove all barriers to a clean implementation of our DemoGraFX layered system by removing the offending restrictions within the "Main Profile, High Level". It is our understanding from the statements of the honorable Chairman Reed Hundt, that the agreement is intended to allow competition in video formats. Consistent with that intent, we would ask the commission to remove the unnecessary barriers and restrictions inherent in "Main Profile, High Level".

DemoGraFX therefore recommends that the commission remove barriers to competition implicit in the "Main Profile, High Level" utilizing one of the following:

A. Remove the restriction of video formats to "Main Profile, High Level".

or

B. Allow, in addition to "Main Profile, High Level", each of the following:

- *36 Hz frame rate*
- *72 Hz frame rate*
- *Horizontal Resolutions up to 2048*

or

C. Remove the restrictions on resolution and frame rate in "Main Profile, High Level"

By removing these restrictions, the commission will more fully open competition to computer-compatible systems, such as ours, which operate at 72 Hz, and which create an image of 2048 x 1024.

Since DemoGraFX, at present, has the only competing alternative to the ATSC proposal, it is inappropriate to place barriers and limitations on the ability of broadcasters to choose and send our formats.

Although our base layer of 1024 x 512 @ 36 Hz can be embedded using frame repeat within 60 Hz, it would be much simpler and more efficient to allow frame_rate_extension_n and frame_rate_extension_d to take the values of 2/1 (meaning 3/2 times 24 = 36 Hz) and 2/0 (meaning 3/1 times 24 = 72 Hz).

DemoGraFX has determined through perceptual experiments that the frame rate of 24 cannot be used as a temporal base layer for a 72 frame-per-second moving image. The frame rate of 36, however, provides an excellent temporal base layer. We invite the commission to view this demonstration to understand why the frame rate of 36 Hz is critical to our temporal layering. There was insufficient time to show this demonstration during the visits of the honorable Chairman Hundt and the honorable Commissioner Chong. However, this demonstration shows conclusively why our temporal layering requires that we be allowed to send the base layer at 36 Hz.

The 60 Hz maximum frame rate specified in "Main Profile, High Level", is also an obvious barrier to competition from 72 Hz. Fortunately we construct our 72 Hz on top of a temporal base layer of 36 Hz, so we can achieve 72 Hz despite this limitation, using our temporal layer. However, the 60 Hz maximum rate restriction does create confusion, and could also be interpreted as preventing us to put our "B" frames for the 72 Hz rate boost into the same video stream.

We therefore ask the commission to enable the true competition in video formats by removing the frame rate and other restrictions which are subtly implicit within the agreement's restriction to use of "Main Profile, High Level".

It also appears that DemoGraFX enhancement layers would be allowed under the agreement, as long as they are sent with alternate PID's. However, we ask that the commission technically

verify this, since the wording that data broadcasting cannot be used for audio and video leads to some confusion in this regard.

The commission could specfically allow the DemoGraFX base layer and enhancement layers, or it could request assurances that the agreement can be interpreted to allow DemoGraFX formats. We believe that our formats would be possible, although somewhat clumsy, under the agreement, but we are unable to completely verify this. We therefore look to the commission for clarification, in the expectation that it is not the commission's intent to artificially limit competition by blocking viable candidate video formats due to subtle hidden implications of the agreement.

Receiver Cost Implications Of "Main Profile, High Level"

There are a number of problems with the receiver cost implications of "Main Profile, High Level".

These cost problems include the following:

- 62 Mpixels/second is a very high decoder rate requirement, and will be costly
- 1920 x 1152 exceeds 2Mpixels by a little, resulting in extra memory cost
- Interlace is allowed, burdening non-interlaced receivers with de-interlacer cost
- B frames are allowed, adding additional cost
- Non-square pixel spacing is allowed, placing an extra computational cost burden on receivers

Thus, "Main Profile, High Level" is a very costly performance level.

As the commission is aware, DemoGraFX has consistently proposed our alternative system which uses a low-cost Base Layer, augmented with temporal and resolution enhancement layers.

The use of a layered system, such as ours, significantly reduces receiver cost. However, this only operates properly if every location has a base layer available for every channel.

The DemoGraFX system, by comparison to "Main Profile, High Level", does not have these cost burdens. The Base Layer has the following properties for comparison:

- 19 Mpixels/second is a much more modest decoder rate
- 1024 x 512 fits neatly within 1/2 Mpixel, allowing decoder, display, and overlay memory requirements to fit within 4 Mbytes
- Interlace is not present (removed prior to transmission if present in the source), removing costs and quality loss issues associated with interlace.
- B frames are not allowed in the base temporal layer, reducing cost and memory requirements
- The pixel spacing is square, eliminating conversion cost

It should also be noted that the DemoGraFX base layer is very high quality. It is considered by many who see our demonstration to be of equivalent quality to previous high definition systems, yet its quality does not come at a high cost. It is agreed by all who see it that its quality is vastly superior to today's NTSC television system.

It is not possible to give an exact cost comparison of the base layer against the "Main Profile, High Level". However, the DemoGraFX base layer video decoder is probably less than 1/4 the cost of a decoder capable of decoding "Main Profile, High Level". This could add to tens of Billions of Dollars to consumers. The commission should therefore consider the acceptance of this agreement carefully, since the implications of cost to consumers are staggering. That is in addition to costs to broadcasters and other industries to deploy and then potentially replace a national infrastructure.

It may also be necessary to consider mandatory labeling of receivers concerning their properties such as:

- Whether they use interlace, and thereby hinder the presentation of legible text and graphics
- Whether they can receive all signal formats, or which signal format types they can receive
- A potential quality rating on de-interlacer performance and format conversion performance
- A specification of screen aspect ratio format and presentation options.
- Disclosure of the screen's frame rate, indicating that 60 Hz viewing may result in eye fatigue

Without such ratings/disclosures on the receiver, consumers may find that the digital ATV set that looks good on the store signals does not look good on the broadcast signals available in their home, and may not look good on other desired services such as email and the internet.

It may fall to congress to assist the commission with consumer interests given the wide disparities in receiver performance possible under the agreement.

Possible Solution

A possible solution to the problem of receiver cost burdens implicit with "Main Profile, High Level" is for the commission to allocate additional spectrum toward solving this problem. Of course, the allocation of spectrum is a precious commodity of high value, so DemoGraFX would recommend first that the base layer be required, in order to optimize both spectrum and receiver costs to consumers. However, if the commission proceeds along the lines of the agreement, hopefully with the additions and modifications suggested here, the commission can solve the receiver cost problem by ensuring that every location has the DemoGraFX base layer, or an equivalent, available.

This could be achieved by allocating broadcast licenses for re-broadcasters and repeaters, which function as format converters to create and transmit a base-layer for every other broadcast channel sending "Main Profile, High Level" formats. The format decoding, format conversion, and re-encoding would be a value-add service for these re-broadcast licensees. It would provide a service to the public, by allowing a computer-compatible base-layer to be received at low cost.

Thus, DemoGraFX recommends that the commission allocate an additional re-broadcast license corresponding to every ATV licensee who chooses to send non-base-layer "Main Profile, High Level" formats such as those which use interlace.

In this way, although some broadcasters may choose to send ATV formats which are incompatible with computers, or expensive to decode, such as full "Main Profile, High Level", the consumers in each location will also be able to receive these same signals in a cleaned-up and cost-reduced fashion from re-broadcast licensees.

The amount of spectrum necessary for base-layer re-broadcast will normally be around 6 mbits/second for high-frame rate sports coverage, and 4mbits/second for movies. If the base layer includes temporal enhancement in the re-broadcast, then 9mbits/second will be required. Thus, between two and four channels of re-broadcast can be provided by each 6 Mhz re-broadcast licensee.

For those broadcasters who choose to send the full DemoGraFX signal for 72 Hz sports (2048 x 1024 resolution), the entire channel of 19.3mbits/second would be allocated to a combination of 9mbits/second for the base layer, and 9.5mbits/second for the enhancement layer (the remainder available for headers, data, and sound). For films at the full resolution, only 8mbits/second are required (4mbits/second enhancement plus 4mbits/second base layer), allowing two such channels.

Such DemoGraFX-format transmission would be original ATV, and would not require rebroadcast spectrum.

Thus, the most efficient scenario for optimizing both spectrum use and receiver performance at low cost would be to discard the agreement and select the DemoGraFX layered ATV system. However, in the absence of such a step, the allocation of additional re-broadcast licenses would be the best alternative.

It should also be noted that satellite and cable systems offer similar alternatives for signal cleanup and optimization. However, the viability of over-the-air broadcasting depends upon such a re-broadcast plan being put in place concurrent with over-the-air ATV licenses to those who intend to send ATSC-like computer-incompatible formats (e.g. 1920 x 1080 @60I or 704 x 480 @60I).

Consumers will ultimately want to choose their quality of receiver, and whether it is computer compatible. However, they might not be given the choice under the results of implementing the agreement. Broadcasters may choose only to send interlaced formats, and receiver manufacturers may choose to offer only interlaced displays with wide screens. Computer-compatible receivers which are required to receive these interlaced signals will cost more and have a poorer image quality. Unless both computer-compatible receivers and computer-compatible signals to receiver are available, market forces cannot operate. Thus, it falls to the commission to ensure a scenario whereby the computer-compatible signals, such as DemoGraFX base layer, can be received at a low cost and displayed with high quality on computer-compatible displays.

It is in the spirit of assisting the commission with its task that we have here offered our thoughts and recommendations on how the commission may accomplish this.

Summary

In summary, we are asking the commission:

- To Allow the DemoGraFX Layered ATV Video System by minor adjustments to the proposal based upon the agreement, or by specifically allowing our formats, as specified in our comments to the Fifth Notice in this ATV proceeding.

- Ensure that all locations have a base-layer low-cost computer-compatible digital ATV signal available, even if non-computer compatible interlaced formats are also transmitted in the same location. Alternatively, the commission could mandate the DemoGraFX layered system, and prohibit interlaced formats from being transmitted.

- Attend to the concerns of the Film Coalition by ensuring the integrity of the image.

Respectfully Submitted,

Gary Demos
President/CEO, DemoGraFX